Skills for a Low Carbon Economy: what next?

Austrian 'Masterplan Human Resources in Renewable Energy Sources' (Masterplan HR RES)

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Overview

- Masterplan: a tool for overcoming complexity in VET governance arrangements
- Context: the interface between VET and labour market for a growing economy in the sector of RES in Austria
- Masterplan HR RES: a multi methodological approach to ensure sufficient VET provision and employment to enhance Renewable Energies
- Objectives of the Masterplan HR RES
- Approaches and methods
  - Scenario based skills forecast
  - Screening VET provision
  - Focus on special target groups: women, youth, migrants, older workers 50+
  - Fostering permeability: Competence matrix 'eco energy technology' (VQTS) as an innovation in VET
- Further considerations: policy recommendations of the Masterplan HR RES

Background

Employment in the sector of RES

__ growing interest in ‚green growth' in almost all economic sectors in Austria

__ Growing sector of RES technology in Austria (import + export)

__ Lack of qualified workers for the growing green economy in general

__ Competence deficits in generic and technical green skills in RES sector

Vocational education and training provision

__ Renewal of VET provision: Complexity in VET governance arrangements

__ VET provision for technical green skills: the 'jungle'

__ 'Education for Sustainable Development' (designed to strengthen generic Green Skills) recognised by politics, but not yet mainstreamed in VET

Masterplan HR RES

Reference to EU policy

__The Maastricht Communiqué (2004): to enhance the flexibility of VET systems to enable them to react more effectively and quickly to labour-market needs.

__The Bruges Communiqué (2010): to support VET-labour market cooperation – fostering social dialogue

Reference to national strategies and approaches

__ Austria's government strives for energy-self-sufficiency and plans to base Austrian energy consumption entirely on RES by the year 2050

__The 'Masterplan Environmental Engineering' ('Masterplan Umwelttechnologie'): – focus on improving the Green Skills of workers, but not extensively referring to VET and employment in RES

__ The 'Masterplan Green Jobs': sets a target of the creation of 100.000 jobs by 2020

Masterplans: topics to be discussed

__ Social scientists propose the development of a masterplan following comprehensive planning and co-ordination in different political fields

__ Characteristics of masterplans: what exactly do they serve for?

__ Motto: politicians go away – masterplans stay

__ Masterplans in the context of governance of VET sub-systems

__ 'good' governance: guiding principles

__ Problems of legitimacy

Objective of the Masterplan HR RES

The Masterplan HR RES shall be a tool that enhances co-operation and communication between the world of work (demand side) and the world of VET (supply side) to further develop Green Skills in the context of RES.

Targets of the Masterplan HR RES

__ to ensure human resources in the Austrian sector of Renewable Energies in the medium and long term which refers to all relevant technological fields (solar thermal energy, photovoltaic, wind energy, biomass energy, etc.);

__ using a participatory approach – fostering social dialogue;

__ to serve as a basis for decision-making on education and labour market policy in the form of scenario-based recommendations;

__ Involvement of decision makers from these political fields;

__ to assist educational organizations and VET providers in shaping efficient educational offers within the existing education system (in the sense of transitions, permeabilities and credit transfers);

Approaches and methods

Scenario based skills forecast

__ Quantitative labour market demand:

to develop three different, but internally consistent, human resources scenarios for the quantitative development of each renewable energy source - based on the analysis of existing strategies, master plans and road maps, own calculations, on expert workshops, on a company online survey;

__ Qualitative education and training needs:

to identify the necessary content of initial and continuous education and training programmes today and in future (broken down by sector and qualification level);

Approaches and methods

Screening of VET provision

to achieve a comprehensive overview on initial and continuous education and training on offer for the renewable energy sector (on the basis of curricula, examination tasks etc., but also on the basis of existing studies)

Approaches and methods

Focus on special target groups: women, youth, migrants, older workers 50+

to articulate recommendations on measures likely to mobilise those groups so far underemployed in the field of renewable energy technology;

The leading question is:
'Which groups would be suitable to pursue an educational and vocational pathway in the field of renewable energy and how many workers could be gained through this?'
Given the strong gender imbalance in the technical and scientific disciplines, observance of the gender dimension is central.

Approaches and methods

Recognition of learning outcomes

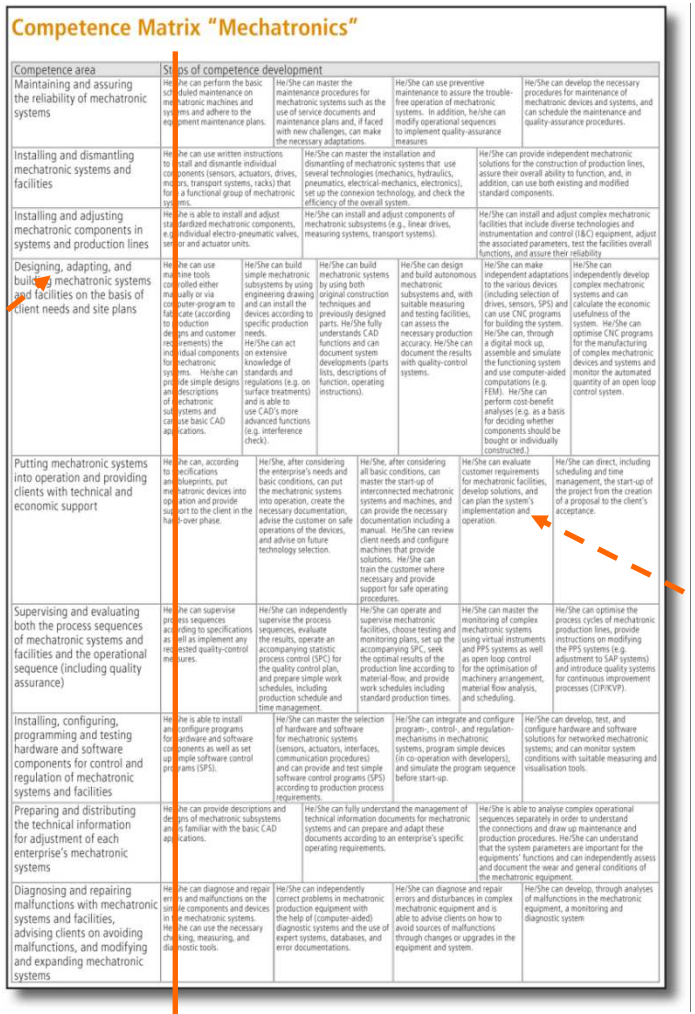
to define the core elements for the mutual recognition of learning outcomes, and to develop propositions to improve the permeability of VET.

__ Definition of qualification contents (competences) that are conveyed through different education and training offers and that can be used for mutual recognition

__ Development of a competence matrix for the specific occupational field ‘eco-energy technology’

Competence Matrix (VQTS)

Competence areas



Competence Matrix "Mechatronics"

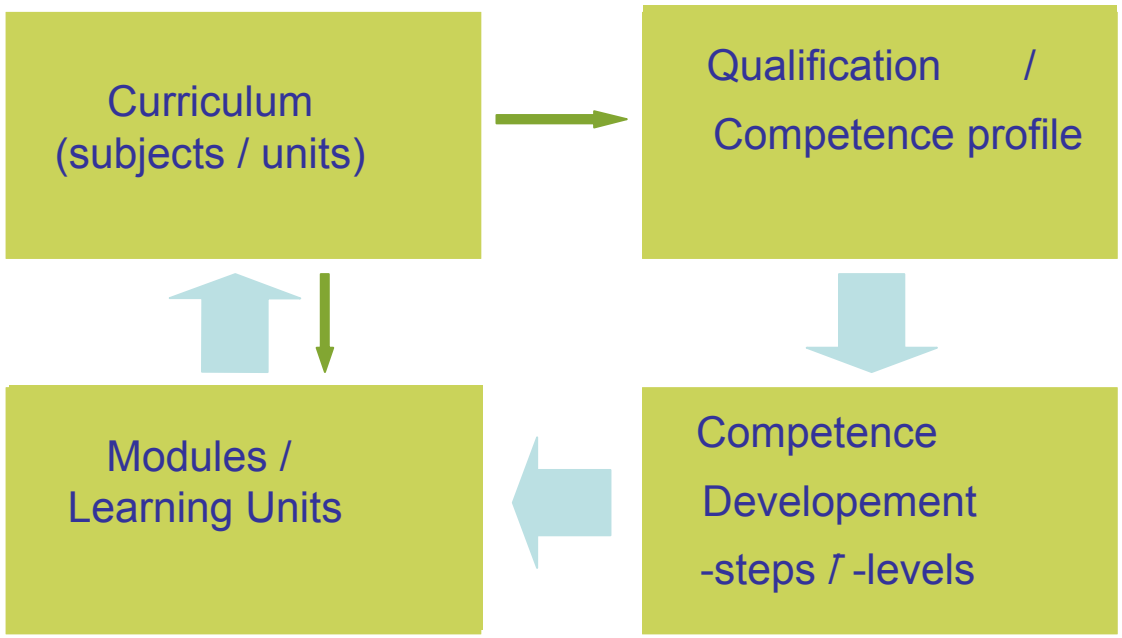
Competence area	Steps of competence development				
Maintaining and assuring the reliability of mechatronic systems	He/She can perform the basic scheduled maintenance on mechatronic machines and systems and adhere to the equipment maintenance plans.	He/She can master the maintenance procedures for mechatronic systems such as the use of service documents and maintenance plans and, if faced with new challenges, can make the necessary adaptations.	He/She can use preventive maintenance to assure the trouble-free operation of mechatronic systems. In addition, he/she can modify operational sequences to implement quality-assurance measures	He/She can develop the necessary procedures for maintenance of mechatronic devices and systems, and can schedule the maintenance and quality-assurance procedures.	
Installing and dismantling mechatronic systems and facilities	He/She can use written instructions to install and dismantle individual components (sensors, actuators, drives, motors, transport systems, racks) that for a functional group of mechatronic systems.	He/She can master the installation and dismantling of mechatronic systems that use several technologies (mechanics, hydraulics, pneumatics, electrical-mechanics, electronics), set up the connexion technology, and check the efficiency of the overall system.	He/She can provide independent mechatronic solutions for the construction of production lines, assure their overall ability to function, and, in addition, can use both existing and modified standard components.		
Installing and adjusting mechatronic components in systems and production lines	He/She is able to install and adjust standardized mechatronic components, e.g. individual electro-pneumatic valves, sensor and actuator units.	He/She can install and adjust components of mechatronic subsystems (e.g., linear drives, measuring systems, transport systems).	He/She can install and adjust complex mechatronic facilities that include diverse technologies and instrumentation and control (I&C) equipment, adjust the associated parameters, test the facilities overall functions, and assure their reliability		
Designing, adapting, and building mechatronic systems and facilities on the basis of client needs and site plans	He/She can use machine tools controlled either manually or via computer-program to fabricate (according to production designs and customer requirements) the individual components for mechatronic systems. He/she can provide simple designs and descriptions of mechatronic subsystems and can use basic CAD applications.	He/She can build simple mechatronic subsystems by using engineering drawing and can install the devices according to specific production needs. He/She can act on extensive knowledge of standards and regulations (e.g. on surface treatments) and is able to use CAD's more advanced functions (e.g. interference check).	He/She can build mechatronic systems by using both original construction techniques and previously designed parts. He/She fully understands CAD functions and can document system developments (parts lists, descriptions of function, operating instructions).	He/She can design and build autonomous mechatronic subsystems and, with suitable measuring and testing facilities, can assess the necessary production accuracy. He/She can document the results with quality-control systems.	He/She can make independent adaptations to the various devices (including selection of drives, sensors, SPS) and can use CNC programs for building the system. He/She can, through a digital mock up, assemble and simulate the functioning system and use computer-aided computations (e.g. FEM). He/She can perform cost-benefit analyses (e.g. as a basis for deciding whether components should be bought or individually constructed.)	He/She can independently develop complex mechatronic systems and can calculate the economic usefulness of the system. He/She can optimise CNC programs for the manufacturing of complex mechatronic devices and systems and monitor the automated quantity of an open loop control system.
Putting mechatronic systems into operation and providing clients with technical and economic support	He/She can, according to specifications and blueprints, put mechatronic devices into operation and provide support to the client in the hand-over phase.	He/She, after considering the enterprise's needs and basic conditions, can put the mechatronic systems into operation, create the necessary documentation, advise the customer on safe operations of the devices, and advise on future technology selection.	He/She, after considering all basic conditions, can master the start-up of interconnected mechatronic systems and machines, and can provide the necessary documentation including a manual. He/She can review client needs and configure machines that provide solutions. He/She can train the customer where necessary and provide support for safe operating procedures.	He/She can evaluate customer requirements for mechatronic facilities, develop solutions, and can plan the system's implementation and operation.	He/She can direct, including scheduling and time management, the start-up of the project from the creation of a proposal to the client's acceptance.
Supervising and evaluating both the process sequences of mechatronic systems and facilities and the operational sequence (including quality assurance)	He/She can supervise process sequences according to specifications as well as implement any requested quality-control measures.	He/She can independently supervise the process sequences, evaluate the results, operate an accompanying statistic process control (SPC) for the quality control plan, and prepare simple work schedules, including production schedule and time management.	He/She can operate and supervise mechatronic facilities, choose testing and monitoring plans, set up the accompanying SPC, seek the optimal results of the production line according to material-flow, and provide work schedules including standard production times.	He/She can master the monitoring of complex mechatronic systems using virtual instruments and PPS systems as well as open loop control for the optimisation of machinery arrangement, material flow analysis, and scheduling.	He/She can optimise the process cycles of mechatronic production lines, provide instructions on modifying the PPS systems (e.g. adjustment to SAP systems) and introduce quality systems for continuous improvement processes (CIP/KVP).
Installing, configuring, programming and testing hardware and software components for control and regulation of mechatronic systems and facilities	He/She is able to install and configure programs for hardware and software components as well as set up simple software control programs (SPS).	He/She can master the selection of hardware and software for mechatronic systems (sensors, actuators, interfaces, communication procedures) and can provide and test simple software control programs (SPS) according to production process requirements.	He/She can integrate and configure program-, control-, and regulation-mechanisms in mechatronic systems, program simple devices (in co-operation with developers), and simulate the program sequence before start-up.	He/She can develop, test, and configure hardware and software solutions for networked mechatronic systems; and can monitor system conditions with suitable measuring and visualisation tools.	
Preparing and distributing the technical information for adjustment of each enterprise's mechatronic systems	He/She can provide descriptions and designs of mechatronic subsystems and is familiar with the basic CAD applications.	He/She can fully understand the management of technical information documents for mechatronic systems and can prepare and adapt these documents according to an enterprise's specific operating requirements.	He/She is able to analyse complex operational sequences separately in order to understand the connections and draw up maintenance and production procedures. He/She can understand that the system parameters are important for the equipments' functions and can independently assess and document the wear and general conditions of the mechatronic equipment.		
Diagnosing and repairing malfunctions with mechatronic systems and facilities, advising clients on avoiding malfunctions, and modifying and expanding mechatronic systems	He/She can diagnose and repair errors and malfunctions on the drive components and devices in the mechatronic systems. He/She can use the necessary checking, measuring, and diagnostic tools.	He/She can independently correct problems in mechatronic production equipment with the help of (computer-aided) diagnostic systems and the use of expert systems, databases, and error documentations.	He/She can diagnose and repair errors and disturbances in complex mechatronic equipment and is able to advise clients on how to avoid sources of malfunctions through changes or upgrades in the equipment and system.	He/She can develop, through analyses of malfunctions in the mechatronic equipment, a monitoring and diagnostic system	

Scope:
Skilled workers in the field of Mechatronics, IVET

Steps of competence development
2-6 steps

Source:
http://www.vocationalqualification.net/vqts/

Using the VQTS model for curriculum development and design…



Demand oriented / modern curriculum design

Supply oriented / traditional curriculum design

Source: own description

Themes for further research

More theoretical considerations

__ Analysis of the Masterplan HR RES as a new governance tool in the context of the political economy of skill formation

Practical perspective

__ How does renewal of VET provision work?: Feedback loops in different organisational fields in the sector of RES (‚Feedback loops' as a research focus of an ongoing Cedefop study; 3s as consortium lead)

__ Monitoring of the implementation of the Masterplan HR RES

__ Maintreaming ‚Education for Sustainable Development' in VET in Austria

Further information

Project consortium

Project funded by

Online

www.masterplan-energie2020.at